AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions of claims in the application:

Listing of Claims:

1.   (Currently Amended) A method of determining the location of an Internet host using a ~~first~~ computer system, comprising:

obtaining route information relating to ~~first and second~~ a network path[[s]] between a host IP address associated with the Internet host and the ~~first~~ computer system ~~and a second computer system, respectively~~, wherein the ~~first~~ network path comprises the ~~first~~ computer system, the Internet host, and at least one intermediate network node, ~~the second network path comprises the second computer system, the Internet host, and at least another intermediate network node~~, and wherein the route information comprises a plurality of router labels associated with the host IP address and ~~one of~~ the at least one intermediate network node ~~and the at least another intermediate network node~~;

extracting a ~~first~~ location code from the route information corresponding to a router label associated with one of the Internet host and an intermediate network node proximate the Internet host;

consulting a data store comprising at least one data set having location codes and corresponding location information;

obtaining ~~first~~ location information from the data store corresponding to the ~~first~~ location code associated with the one of the Internet host and the intermediate network node proximate the Internet host; ~~and~~

providing a ~~first~~ location estimate of the location of the Internet host according to the ~~first~~ location information from the data store corresponding to the ~~first~~ location code;

<u>determining a delay time associated with the network path; and</u>

<u>selectively correcting the location estimate according to the delay time associated with the network path.</u>

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2.   (Currently Amended) The method of claim 1, further comprising[[:]] extracting the location code by examining the router labels in route order along the path from the host to the computer system until a location code is found that is usable to obtain location information from the data store.

~~determining a delay time associated with at least one of the first and second network paths; and~~

~~selectively correcting the first location estimate according to the delay time associated with the at least one of the first and second network paths.~~

3.   (Currently Amended) The method of claim 2, further comprising:

determining a confidence metric representative of the accuracy of the ~~first~~ location estimate; and ~~according to the delay time~~

selectively providing the location estimate of the location of the Internet host if the confidence metric exceeds a threshold.

4.   (Currently Amended) The method of claim 3 [[1]], further comprising:

determining a confidence metric representative of the accuracy of the ~~first~~ location estimate based upon the delay time between the Internet host and the network node associated with the location estimate.~~; and~~

~~selectively providing the first location estimate of the location of the Internet host if the confidence metric exceeds a threshold.~~

5.   (Currently Amended) The method of claim 1, further comprising:

obtaining ~~second~~ route information relating to each ~~the second~~ network path between the host IP address and ~~the second~~ each of a plurality of computer system~~s~~, wherein the ~~second~~ route information comprises a plurality of router labels associated with the host IP address, and each of the plurality of computer systems, and ~~the~~ at least one ~~another~~ intermediate network node in each network path;

extracting a ~~second~~ location code for each network path from the ~~second~~ route information corresponding to a ~~second~~ router label associated with one of the Internet host and the at least one ~~another~~ intermediate network node in each network path;

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obtaining ~~second~~ location information from the data store corresponding to each ~~the~~
~~second~~ location code;

providing a ~~second~~ <u>plurality of</u> location estimates of the location of the Internet host
according to the ~~second~~ location information from the data store corresponding to ~~the second~~
each location code; and

correlating <u>at least two of</u> the ~~first and second~~ location estimates to provide an improved
location estimate of the location of the Internet host.

6.   (Original) The method of claim 1, wherein the location code comprises one of a city
code, and airport code, and a country code, and wherein obtaining the route information
comprises using a traceroute tool.

7.   (Currently Amended) A software tool for determining the location of an Internet host
using a ~~first~~ computer system, comprising:

a route trace component adapted to obtain route information relating to ~~first and second~~ <u>a</u>
network path[[s]] between a host IP address associated with the Internet host and the ~~first~~
computer system ~~and a second computer system, respectively~~, wherein the first network path
comprises the ~~first~~ computer system, the Internet host, and at least one intermediate network
node, ~~the second network path comprises the second computer system, the Internet host, and at~~
~~least another intermediate network node,~~ and wherein the route information comprises a plurality
of router labels associated with the host IP address and ~~one of~~ the at least one intermediate
network node ~~and the at least another intermediate network node~~;

an extraction component adapted to extract a ~~first~~ location code from the route
information corresponding to a router label associated with one of the Internet host and an
intermediate network node proximate the Internet host;

a data store comprising at least one data set having location codes and corresponding
location information; ~~and~~

an estimation component adapted to obtain ~~first~~ location information from the data store
corresponding to the ~~first~~ location code associated with the one of the Internet host and the
intermediate network node proximate the Internet host, and to provide a ~~first~~ location estimate of

the location of the Internet host according to the ~~first~~ location information from the data store corresponding to the ~~first~~ location code;.

a correction component to determine a delay time associated with the network path and selectively correct the location estimate according to the delay time associated with the network path.

8.   (Currently Amended) A computer-readable medium having computer-executable instructions for:

obtaining route information relating to ~~first and second~~ a network path[[s]] between a host IP address associated with an Internet host and a ~~first~~ computer system ~~and a second computer system, respectively,~~ wherein the ~~first~~ network path comprises the ~~first~~ computer system, the Internet host, and at least one intermediate network node, ~~the second network path comprises the second computer system, the Internet host, and at least another intermediate network node,~~ and wherein the route information comprises a plurality of router labels associated with the host IP address and ~~one of~~ the at least one intermediate network node ~~and the at least another intermediate network node~~;

extracting a ~~first~~ location code from the route information corresponding to a router label associated with one of the Internet host and an intermediate network node proximate the Internet host;

consulting a data store comprising at least one data set having location codes and corresponding location information;

obtaining ~~first~~ location information from the data store corresponding to the ~~first~~ location code associated with the one of the Internet host and the intermediate network node proximate the Internet host; ~~and~~

providing a ~~first~~ location estimate of the location of the Internet host according to the ~~first~~ location information from the data store corresponding to the ~~first~~ location code;

determining a delay time associated with the network path; and

selectively correcting the location estimate according to the delay time associated with the network path.

9.   (Currently Amended) A system for determining the location of an Internet host, comprising:

a first component operating in a ~~first~~ computer system to obtain route information relating to ~~first and second~~ a network path[[s]] between a host IP address associated with the Internet host and the ~~first~~ computer system ~~and a second computer system, respectively~~, wherein the first network path comprises the ~~first~~ computer system, the Internet host, and at least one intermediate network node, ~~the second network path comprises the second computer system, the Internet host, and at least another intermediate network node,~~ and wherein the route information comprises a plurality of router labels associated with the host IP address and ~~one of~~ the at least one intermediate network node ~~and the at least another intermediate network node~~;

a second component operating in the first computer system to extract a first location code from the route information corresponding to a router label associated with one of the Internet host and an intermediate network node proximate the Internet host;

a third component operating in the ~~first~~ computer system to consult a data store comprising at least one data set having location codes and corresponding location information;

a fourth component operating in the ~~first~~ computer system to obtain ~~first~~ location information from the data store corresponding to the ~~first~~ location code associated with the one of the Internet host and the intermediate network node proximate the Internet host; ~~and~~

a fifth component operating in the ~~first~~ computer system to provide a ~~first~~ location estimate of the location of the Internet host according to the ~~first~~ location information from the data store corresponding to the ~~first~~ location code; and

a sixth component operating in the computer system to determine a delay time associated with the network path and selectively correct the location estimate according to the delay time associated with the network path.

10.   (Currently Amended) Geographical location estimate data associated with an Internet host, the estimate data resulting from a process executing on a computer system, comprising ~~of~~:

obtaining route information relating to ~~first and second~~ a network path[[s]] between a host IP address associated with the Internet host and a ~~first~~ computer system ~~and a second computer system, respectively~~, wherein the ~~first~~ network path comprises the ~~first~~ computer system, the Internet host, and at least one intermediate network node, ~~the second network path~~

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~~comprises the second computer system, the Internet host, and at least another intermediate network node;~~ and wherein the route information comprises a plurality of router labels associated with the host IP address and ~~one of~~ the at least one intermediate network node ~~and the at least another intermediate network node~~;

extracting a ~~first~~ location code from the route information corresponding to a router label associated with one of the Internet host and an intermediate network node proximate the Internet host;

consulting a data store comprising at least one data set having location codes and corresponding location information;

obtaining ~~first~~ location information from the data store corresponding to the ~~first~~ location code associated with the one of the Internet host and the intermediate network node proximate the Internet host; and

providing a ~~first~~ location estimate of the location of the Internet host according to the ~~first~~ location information from the data store corresponding to the ~~first~~ location code<u>;</u>

<u>determining a delay time associated with the network path; and</u>

<u>selectively correcting the location estimate according to the delay time associated with the network path.</u>

11.   (Currently Amended) A method of determining the location of an Internet host using multiple computer systems, comprising:

obtaining route information relating to a plurality of network paths between a host IP address associated with the Internet host and a corresponding plurality of computer systems, respectively, wherein the plurality of network paths individually comprise a corresponding computer system, the Internet host, and at least one intermediate network node, and wherein the route information comprises a plurality of router labels associated with the host IP address and an intermediate network node;

extracting a location code from the route information corresponding to a router label associated with one of the Internet host and an intermediate network node proximate the Internet host;

consulting a data store comprising at least one data set having location codes and corresponding location information;

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obtaining location information from the data store corresponding to the location code associated with the one of the Internet host and the intermediate network node proximate the Internet host; and

providing a location estimate of the location of the Internet host according to the location information.

determining a delay time associated with at least one of the network paths; and

selectively correcting the location estimate according to the delay time.

12.   (Original) A method of determining the location of an Internet host using a first computer system, comprising:

measuring a first delay time relating to a first network path between a host IP address associated with the Internet host and the first computer system;

measuring a second delay time relating to a second network path between the host IP address and a second computer system;

measuring a third delay time relating to a third network path between the host IP address and a third computer system;

correlating the first, second, and third delay times; and

providing a location estimate of the location of the Internet host according to the correlation of the first, second, and third delay times.

13.   (Original) The method of claim 12, wherein correlating the first, second, and third delay times comprises triangulating the first, second, and third delay measurements.

14.   (Original) The method of claim 12, wherein correlating the first, second, and third delay times comprises:

consulting a data store comprising N sets of first, second, and third delay measurements between the first, second, and third computer systems, respectively, and N known hosts, as well as location information associated with the N known hosts, wherein N is an integer;

performing a comparison of the first, second, and third delay times with the N sets of first, second, and third delay measurements in the data store;

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determining a nearest set of first, second, and third delay measurements according to the comparison; and

providing a location estimate of the Internet host according to the nearest set of first, second, and third delay measurements.

15.   (Original) The method of claim 14, wherein performing the comparison of the first, second, and third delay times with the N sets of first, second, and third delay measurements in the data store comprises determining N Euclidian distances corresponding to the Euclidian distances between the N sets of first, second, and third delay measurements in the data store and the first, second, and third delay times, and wherein providing a location estimate of the Internet host according to the nearest set of first, second, and third delay measurements comprises selecting location information associated with the set of first, second, and third delay measurements in the data store associated with the smallest Euclidian distance as the location estimate.

16.   (Original) The method of claim 12,

wherein correlating the first, second, and third delay times comprises:

computing a first probability density function establishing a relationship between a first network delay associated with the first computer system and a first distance from the first computer system;

determining a first distance estimate representative of the distance between the first computer system and the location of the Internet host using the first delay time and the first probability density function;

computing a second probability density function establishing a relationship between a second network delay associated with the second computer system and a second distance from the second computer system;

determining a second distance estimate representative of the distance between the second computer system and the location of the Internet host using the second delay time and the second probability density function;

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computing a third probability density function establishing a relationship between a third network delay associated with the third computer system and a third distance from the third computer system; and

determining a third distance estimate representative of the distance between the third computer system and the location of the Internet host using the third delay time and the third probability density function;

and wherein providing the location estimate comprises triangulating the first, second, and third distance estimates.

17.   (Original) The method of claim 16, wherein determining the first, second, and third distance estimates further comprises computing an error function over a location space, and determining coordinates within the location space where the error function is minimized.

18.   (Original) The method of claim 17, wherein determining coordinates within the location space where the error function is minimized comprises minimizing the error function across a list of known city locations, and wherein providing the location estimate comprises providing the known city location corresponding with the minimum value of the error function.

19.   (Original) The method of claim 18, wherein computing the error function comprises using a weighted least mean squares algorithm to optimize the location estimate.

20.   (Original) The method of claim 18, wherein computing the error function comprises using a probability density estimation to optimize the location estimate.

21.   (Original) The method of claim 18, wherein computing the error function comprises using a weighted least mean squares algorithm to prune a solution space, and using a probability density estimation to optimize the location estimate from the pruned solution space.

22.   (Original) The method of claim 18, wherein computing the error function comprises using a probability density estimation to prune a solution space, and using a weighted least mean squares algorithm to optimize the location estimate from the pruned solution space.

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23.   (Original) A software tool for determining the location of an Internet host using a first computer system, comprising:

a first delay component adapted to measure a first delay time relating to a first network path between a host IP address associated with the Internet host and the first computer system;

a second delay component adapted to measure a second delay time relating to a second network path between the host IP address and a second computer system;

a third delay component adapted to measure a third delay time relating to a third network path between the host IP address and a third computer system;

a correlation component adapted to correlate the first, second, and third delay times; and

an estimation component adapted to provide a location estimate of the location of the Internet host according to the correlation of the first, second, and third delay times.

24.   (Original) A computer-readable medium having computer-executable instructions for:

measuring a first delay time relating to a first network path between a host IP address associated with the Internet host and the first computer system;

measuring a second delay time relating to a second network path between the host IP address and a second computer system;

measuring a third delay time relating to a third network path between the host IP address and a third computer system;

correlating the first, second, and third delay times; and

providing a location estimate of the location of the Internet host according to the correlation of the first, second, and third delay times.

25.   (Original) A system for determining the location of an Internet host, comprising:

a first component operating in a first computer system to measure a first delay time relating to a first network path between a host IP address associated with the Internet host and the first computer system;

a second component operating to measure a second delay time relating to a second network path between the host IP address and a second computer system;

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a third component operating to measure a third delay time relating to a third network path between the host IP address and a third computer system;

a fourth component operating to correlate the first, second, and third delay times; and

a fifth component operating in a first computer system to provide a location estimate of the location of the Internet host according to the correlation of the first, second, and third delay times.

26.   (Currently Amended) Geographical location estimate data associated with an Internet host, the estimate data resulting from a process executing on a computer system, comprising of:

measuring a first delay time relating to a first network path between a host IP address associated with the Internet host and a first computer system;

measuring a second delay time relating to a second network path between the host IP address and a second computer system;

measuring a third delay time relating to a third network path between the host IP address and a third computer system;

correlating the first, second, and third delay times; and

providing a location estimate of the location of the Internet host according to the correlation of the first, second, and third delay times.

27.   (Currently Amended) A method of determining the location of an Internet host using a first computer system, comprising:

obtaining partial IP-to-location mapping information from a data source;
obtaining network routing information;

clustering together IP addresses corresponding to hosts in the same geographic location according to network routing information to obtain cluster information;

correlating the partial IP-to-location information with the cluster information; and

providing a location estimate of the location of the Internet host according to the correlation of the partial IP-to-location information and the cluster information; and

computing a dispersion metric representative of the accuracy of the location estimate of the location of the Internet host.

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28.   (Original) The method of claim 27, wherein obtaining network routing information comprises using a routing protocol.

29.   (Original) The method of claim 28, wherein the routing protocol is one of BGP, RIP, OSPF, IGRP, and EGP.

30.   (Original) The method of claim 27, wherein clustering together IP addresses corresponding to hosts in the same geographic location according to network routing information to obtain cluster information comprises associating an address prefix used by a routing protocol with a geographical location.

31.   (Original) The method of claim 30, further comprising:
       sub-dividing the geographical location associated with the address prefix into at least two clusters according to a geographical spread associated with the geographical location.

32.   (Original) The method of claim 27, further comprising sub-dividing the cluster information according to a geographical spread associated with the geographical location.

33.   (Currently Amended) The method of claim 27, further comprising ~~computing a dispersion metric representative of the accuracy of the location estimate of the location of the Internet host~~ selectively providing the location estimate if the dispersion metric is less than a threshold value.

34.   (Currently Amended) The method of claim 33, further comprising ~~selectively providing the location estimate if the dispersion metric is less than a threshold value~~ a threshold value that is dependent on the size of the cluster.

35.   (Original) The method of claim 27, further comprising:
       obtaining route information relating to a first network path between a host IP address associated with the Internet host and the first computer system, wherein the first network path comprises the first computer system, the Internet host, and at least one intermediate network

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node, and wherein the route information comprises a plurality of router labels associated with the host IP address and the at least one intermediate network node;

extracting a first location code from the route information corresponding to a router label associated with one of the Internet host and an intermediate network node proximate the Internet host;

consulting a data store comprising at least one data set having location codes and corresponding location information;

obtaining first location information from the data store corresponding to the first location code associated with the one of the Internet host and the intermediate network node proximate the Internet host; and

providing a first location estimate of the location of the Internet host according to the first location information from the data store corresponding to the first location code.

36.   (Original) The method of claim 35, further comprising:

measuring a first delay time relating to a first network path between a host IP address associated with the Internet host and the first computer system;

measuring a second delay time relating to a second network path between the host IP address and a second computer system;

measuring a third delay time relating to a third network path between the host IP address and a third computer system;

correlating the first, second, and third delay times; and

providing a location estimate of the location of the Internet host according to the correlation of the first, second, and third delay times.

37.   (Original) The method of claim 27, further comprising:

measuring a first delay time relating to a first network path between a host IP address associated with the Internet host and the first computer system;

measuring a second delay time relating to a second network path between the host IP address and a second computer system;

measuring a third delay time relating to a third network path between the host IP address and a third computer system;

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correlating the first, second, and third delay times; and

providing a location estimate of the location of the Internet host according to the correlation of the first, second, and third delay times.

38.   (Currently Amended) A software tool for determining the location of an Internet host using a first computer system, comprising:

a first component adapted to obtain partial IP-to-location mapping information from a data source;

a routing protocol component adapted to obtain network routing information;

a clustering component adapted to cluster together IP addresses corresponding to hosts in the same geographic location according to network routing information to obtain cluster information;

a correlation component adapted to correlate the partial IP-to-location information with the cluster information; and

an estimation component adapted to provide a location estimate of the location of the Internet host according to the correlation of the partial IP-to-location information and the cluster information; and

a correction component to compute a dispersion metric representative of the accuracy of the location estimate of the location of the Internet host and selectively providing the location estimate.

39.   (Currently Amended) A computer-readable medium having computer-executable instructions for:

obtaining partial IP-to-location mapping information from a data source;

obtaining network routing information;

clustering together IP addresses corresponding to hosts in the same geographic location according to network routing information to obtain cluster information;

correlating the partial IP-to-location information with the cluster information; and

providing a location estimate of the location of the Internet host according to the correlation of the partial IP-to-location information and the cluster information; and

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calculating a dispersion metric representative of the accuracy of the location estimate of the location of the Internet host and selectively providing the location estimate.

40.   (Currently Amended) A system for determining the location of an Internet host, comprising:

a first component operating to obtain partial IP-to-location mapping information from a data source;

a second component operating to obtain network routing information;

a third component operating to cluster together IP addresses corresponding to hosts in the same geographic location according to network routing information to obtain cluster information;

a fourth component operating to correlate the partial IP-to-location information with the cluster information; and

a fifth component operating to provide a location estimate of the location of the Internet host according to the correlation of the partial IP-to-location information and the cluster information; and

a sixth component operating to calculate a dispersion metric representative of the accuracy of the location estimate of the location of the Internet host and selectively providing the location estimate.

41.   (Currently Amended) Geographical location estimate data associated with an Internet host, the estimate data resulting from a process executing on a computer system, comprising of:

obtaining partial IP-to-location mapping information from a data source;

obtaining network routing information;

clustering together IP addresses corresponding to hosts in the same geographic location according to network routing information to obtain cluster information;

correlating the partial IP-to-location information with the cluster information; and

providing a location estimate of the location of the Internet host according to the correlation of the partial IP-to-location information and the cluster information; and

computing a dispersion metric representative of the accuracy of the location estimate of the location of the Internet host and selectively providing the location estimate.

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